

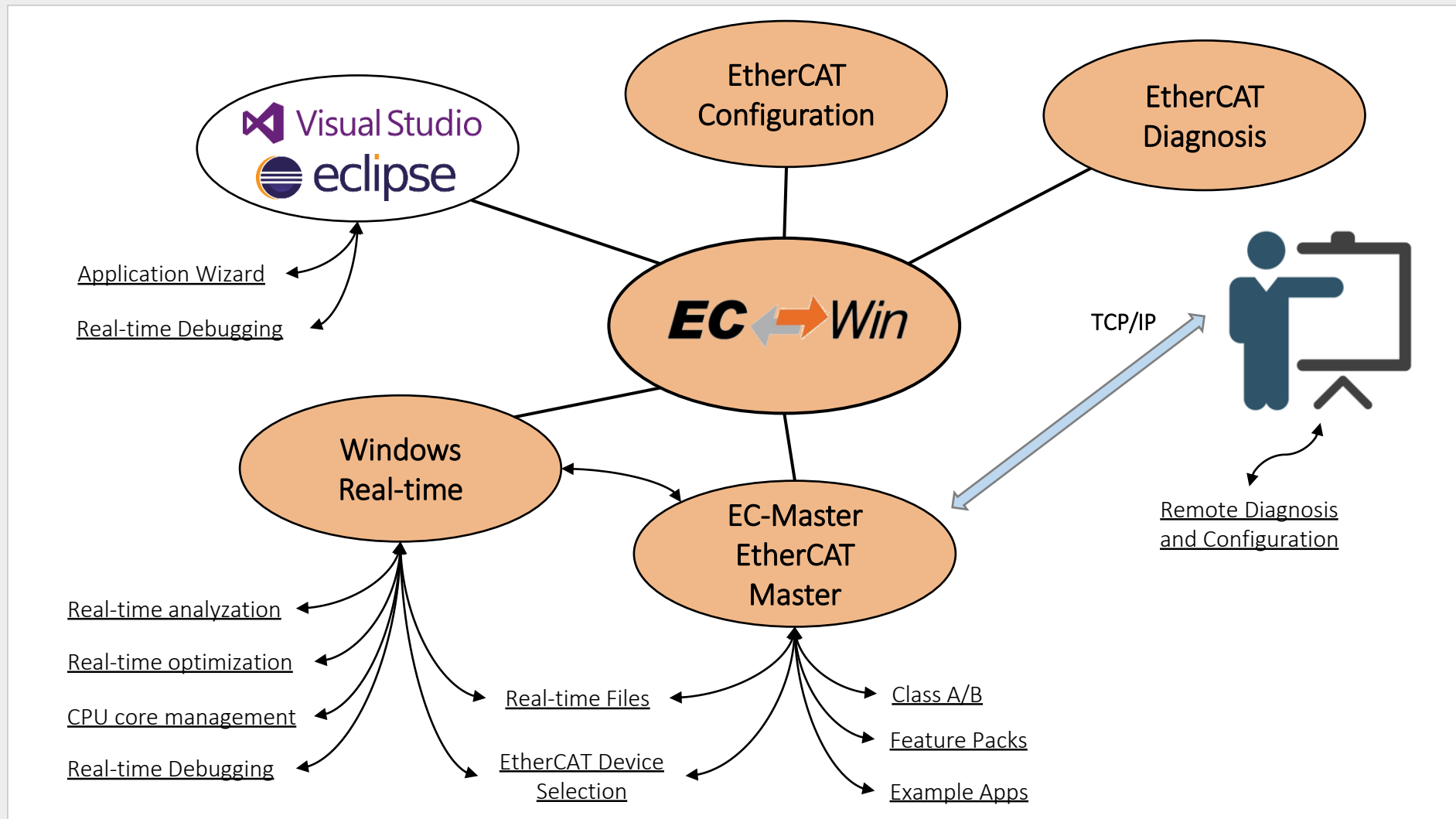


Windows EtherCAT® Real-time Platform based on Real-time Linux

Technical Presentation

EC-Win (RT-Linux)

Fully integrated Windows EtherCAT platform



- Core components
 - Windows Real-time extension based on Real-time Linux
 - EC-Master EtherCAT Master Stack for Linux
 - Running inside the real-time environment

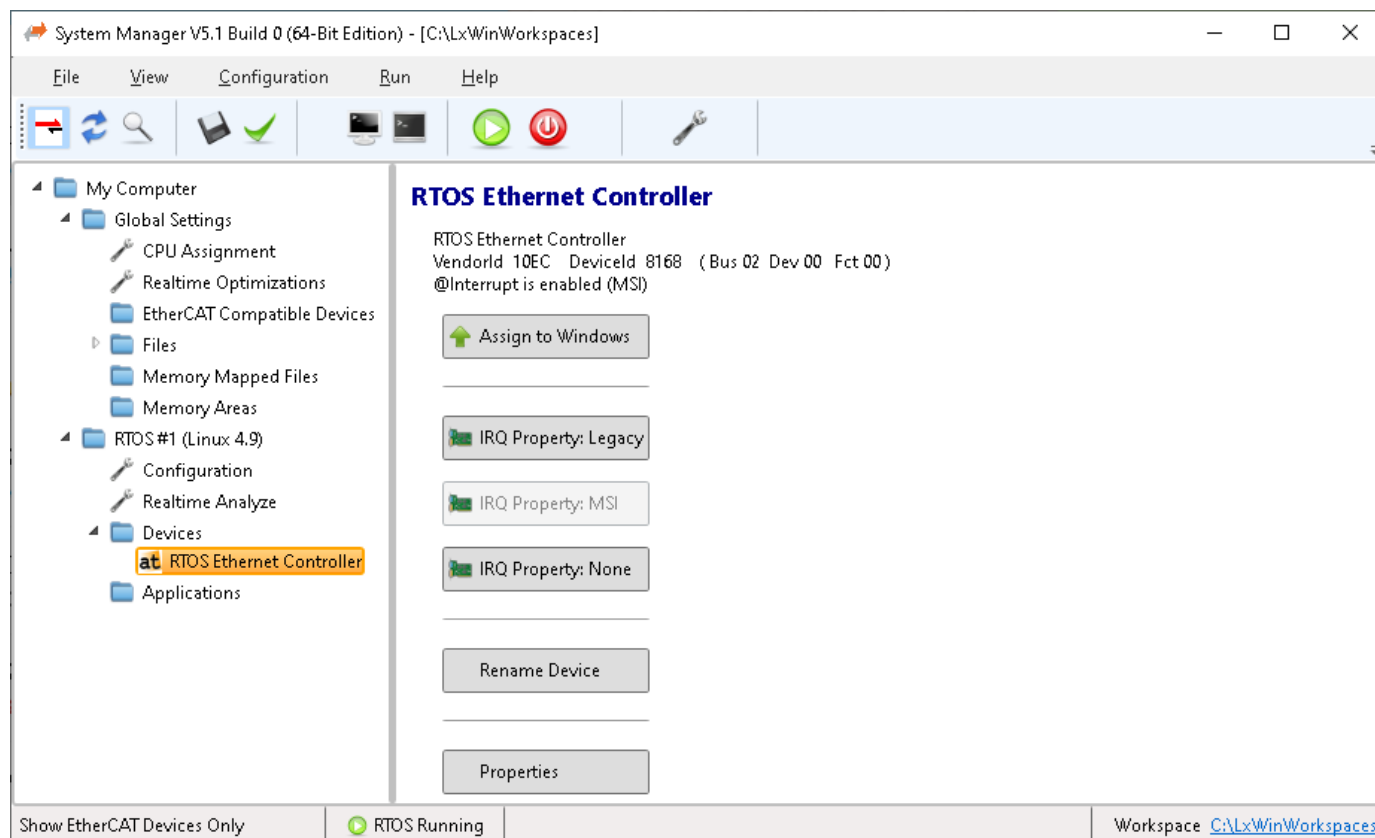
- Optional components
 - EC-Engineer: EtherCAT Configurator Tool
 - EC-Lyser: EtherCAT Diagnosis Tool
 - EtherCAT Master Feature Packs
 - Hot Connect
 - Cable Redundancy
 - TCP/IP Remote API (to connect with Remote Gateway)

EC  ***Win***

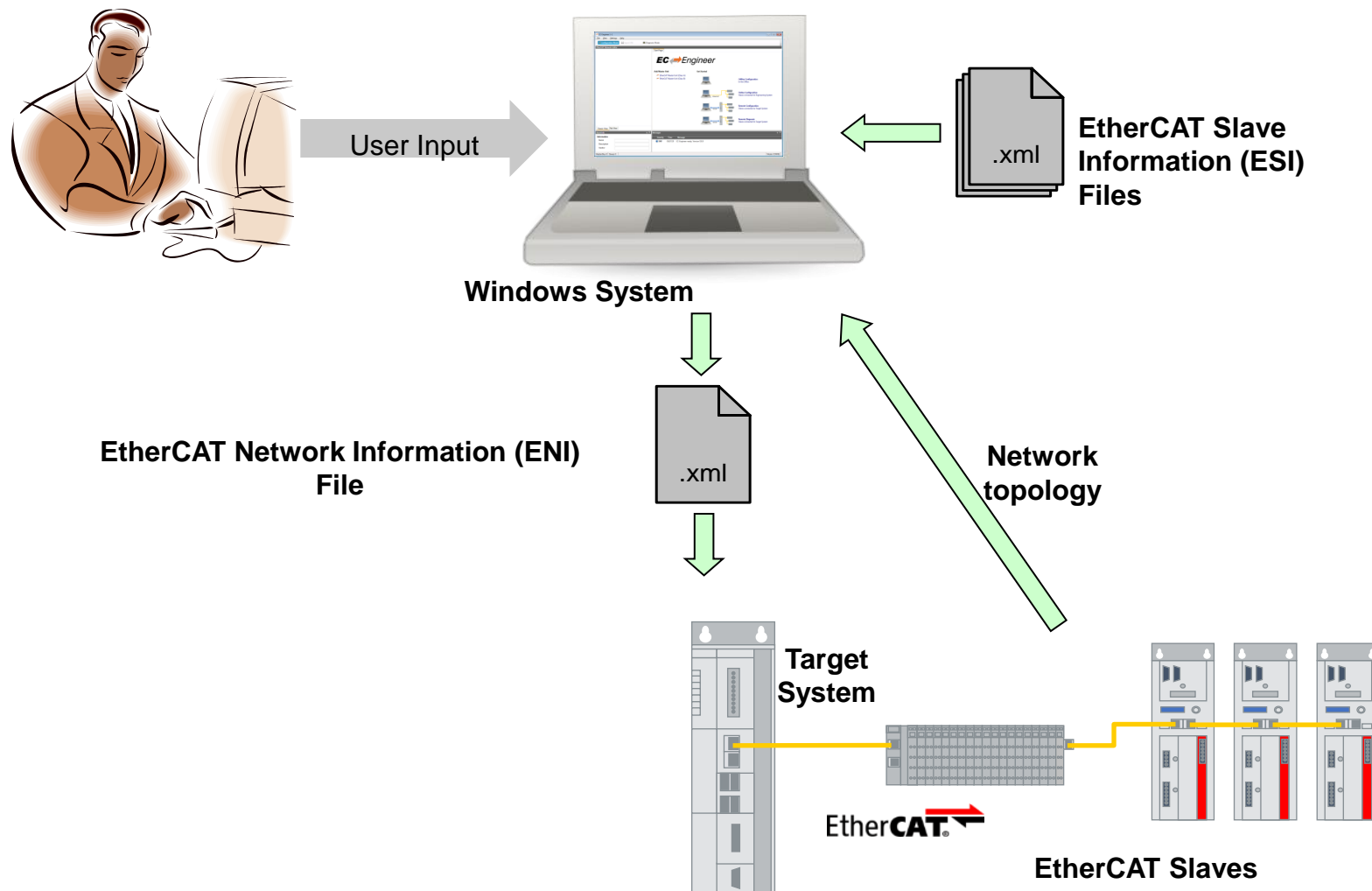
EtherCAT Integration

EtherCAT compatible Ethernet Controller

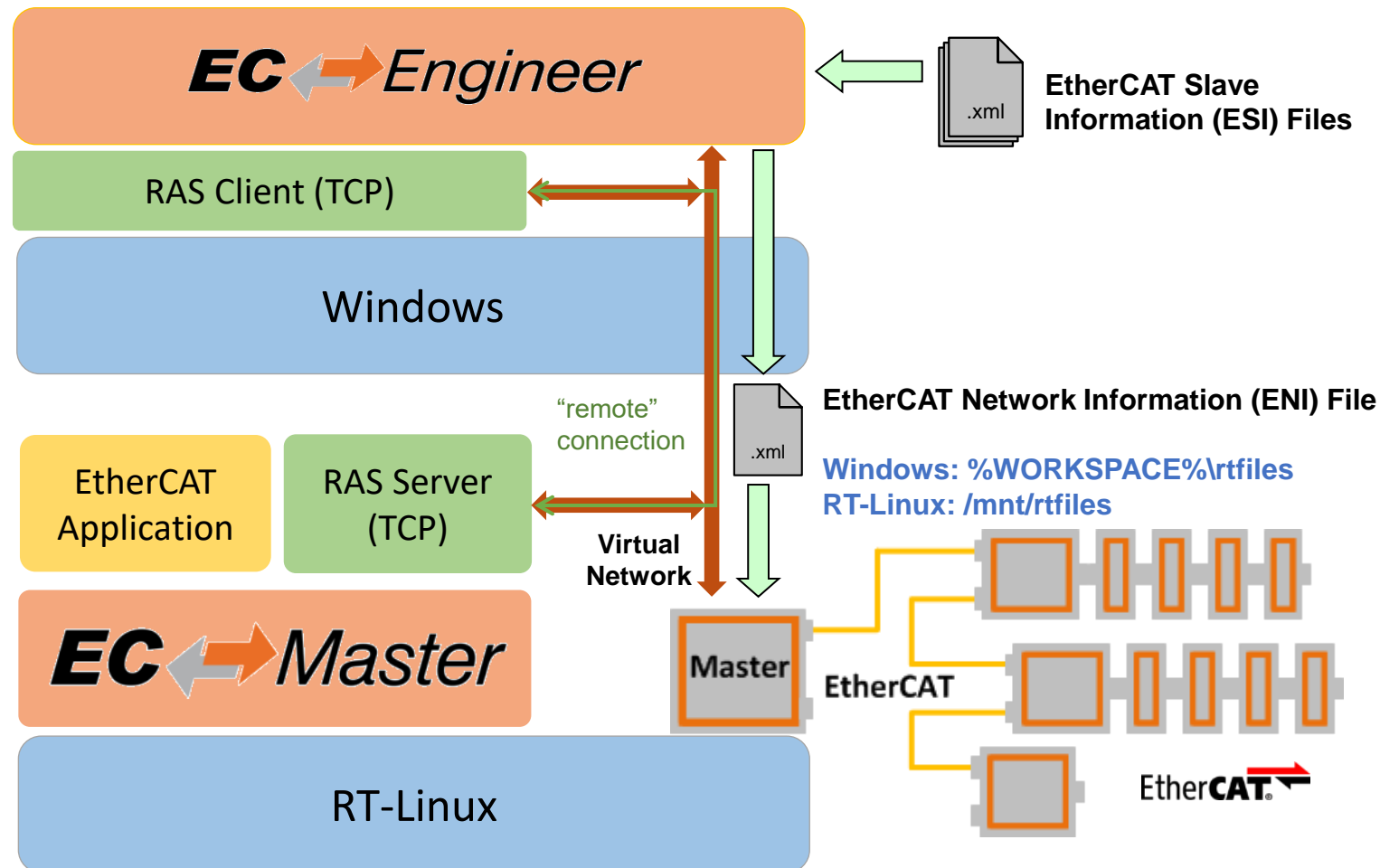
- Automatically detect all Ethernet Controllers that are supported by the EtherCAT master
- Assign to the real-time part



EtherCAT Network Configuration Data Flow



EC-Win (RT-Linux): “Remote” Configuration

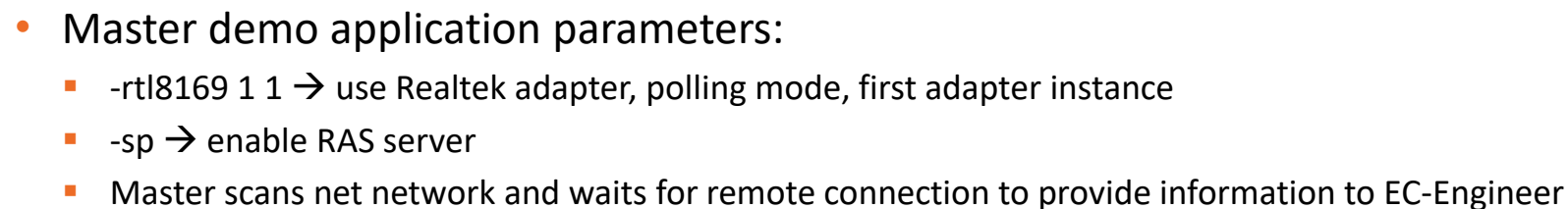




Typical Workflow

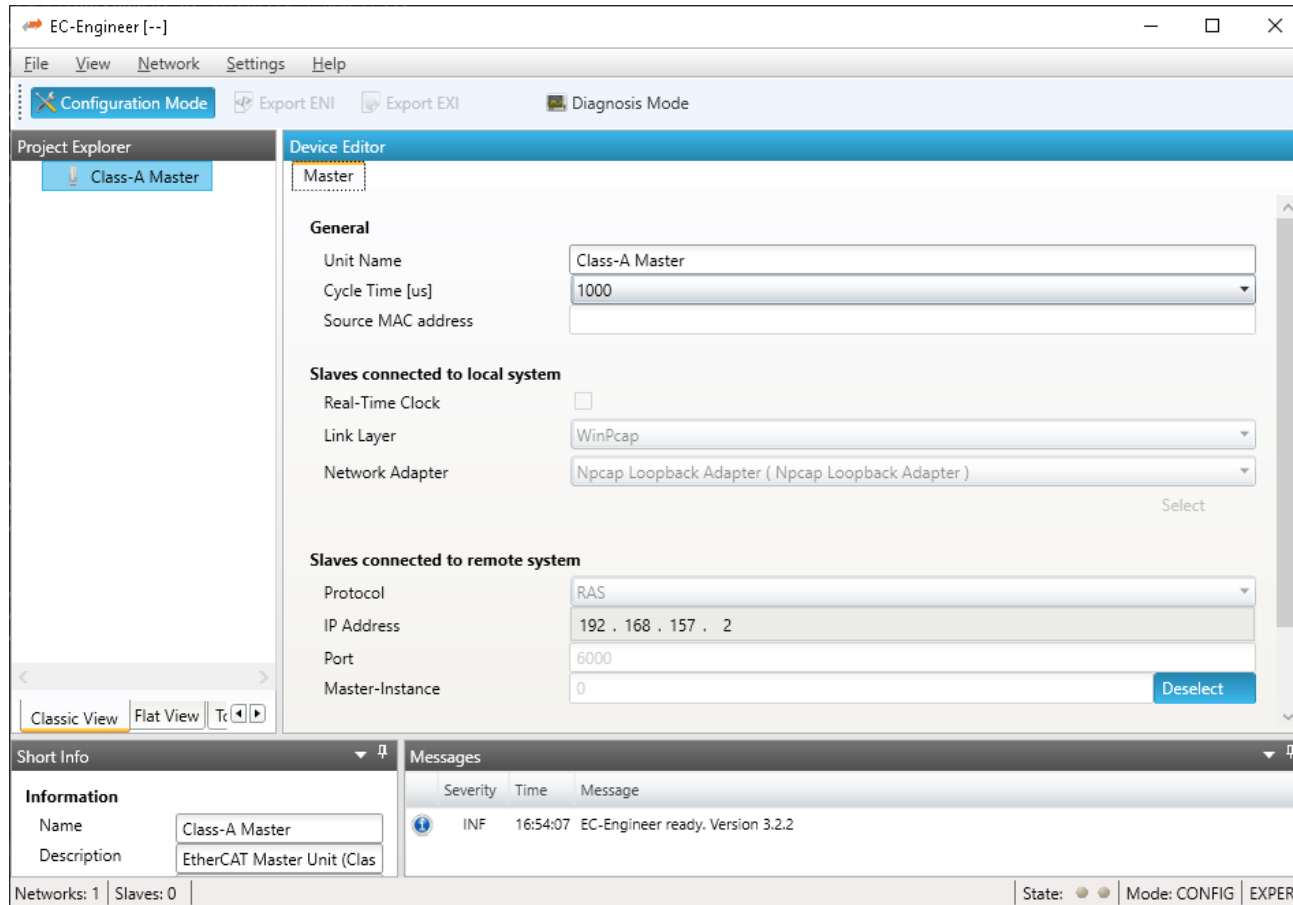
EC-Engineer and RT-Linux on the same machine

The screenshot displays the EC-Engineer software interface. The main window is titled 'EC-Engineer [--]' and features a menu bar with 'File', 'View', 'Network', 'Settings', and 'Help'. Below the menu bar, there are tabs for 'Configuration Mode' (selected), 'Export ENI', 'Export EXI', and 'Diagnosis Mode'. The 'Project Explorer' on the left shows a 'Start Page' in the 'Device Editor'. The main area displays the 'EC Engineer' logo and a 'Getting Started' section with a laptop icon. Below this, there are two sections: 'Add Master Unit' and 'Recent Projects'. The 'Add Master Unit' section lists three options: 'EtherCAT Master Unit (Class A)', 'EtherCAT Master Unit (Class B)', and 'EtherCAT Simulator Unit'. The 'Recent Projects' section lists five files: 'C:\LxWinWorkspaces\...\EL3702.ecc', 'C:\LxWinWorkspaces\...\syncmotor.ecc', 'C:\Users\...\heizung2.ecc', and 'C:\Users\...\heizung1.ecc'. On the right, a terminal window titled 'VIO0 - PuTTYtel' shows a command prompt with the path 'root@vmf:/mnt/rtfiles#' repeated multiple times. Below the terminal, there is a diagram illustrating the system configuration. The diagram shows a laptop connected to a 'Master' unit via 'TCP/IP', which then connects to multiple 'Slaves' via 'EtherCAT'. The diagram is divided into two parts: 'Online Configuration' (Slaves connected to engineering system) and 'Remote Configuration' (Slaves connected to target system).

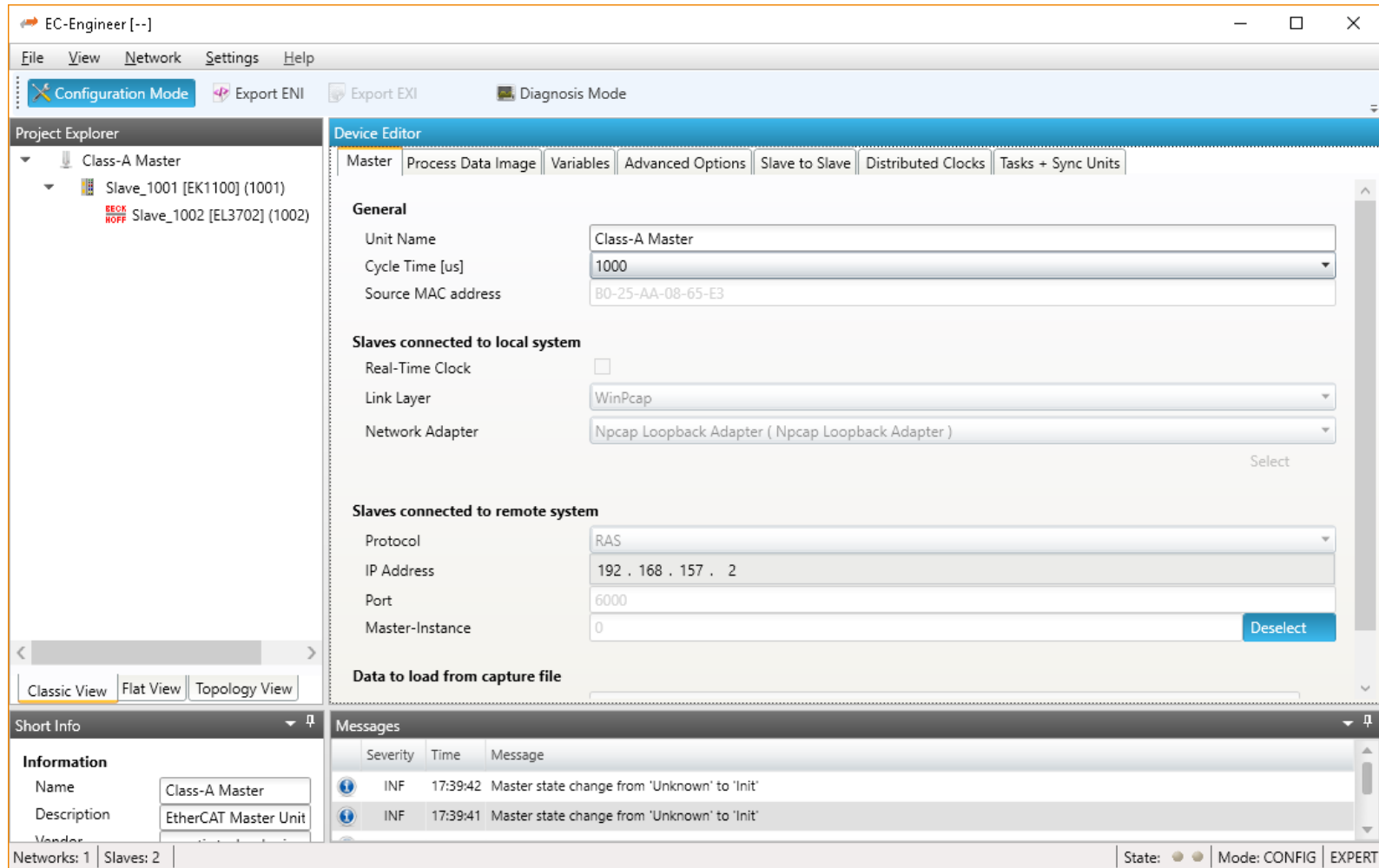


Step 2: EC-Engineer remote connection

- Default IP address: 192.168.157.2

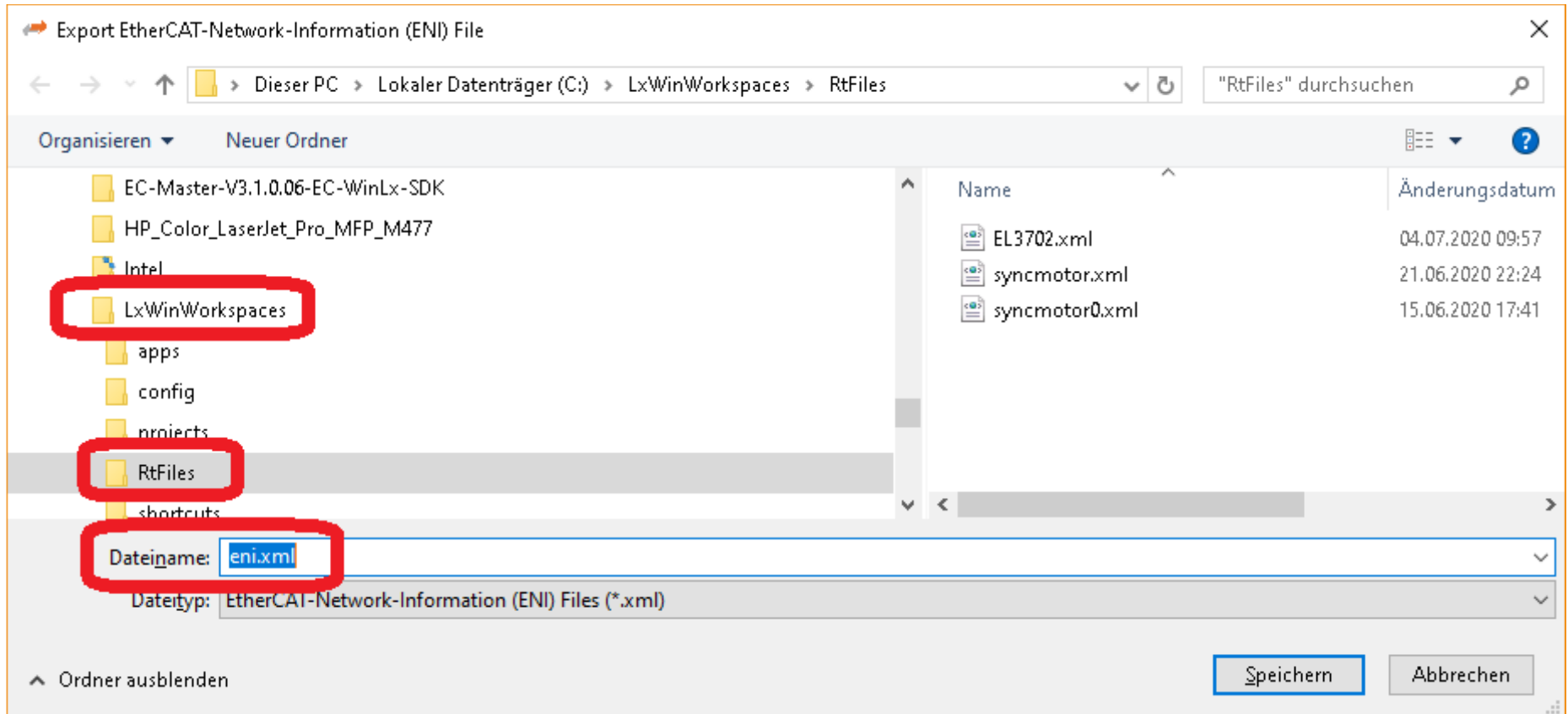


Step 3: Scan the network



Step 3: Export ENI

- Store in rtfiles directory in the LxWin workspace



Step 4: run master with ENI

```
VIO0 - PuTTYtel
root@vmf:/mnt/rfiles#
root@vmf:/mnt/rfiles#
root@vmf:/mnt/rfiles#
root@vmf:/mnt/rfiles# ./EcMasterDemo -f /mnt/rfiles/eni.xml -rtl8169 1 1 -sp
0000000043: Full command line: -f "/mnt/rfiles/eni.xml"-rtl8169 1 1 -sp
0000000044: Start Remote API Server now
0000000045: EC-Master V3.1.0.06 for EC-WinLx_x86 Copyright acontis technologies GmbH @ 2019
atemsys: device_open(0xe8d78600)
atemsys: pci_find: ven 0x10ec dev 0xffff nInstance 0
atemsys: pci_find: device 0x10ec:0xffff:0 not found
atemsys: pci_find: ven 0x10ec dev 0x8169 nInstance 0
atemsys: pci_find: device 0x10ec:0x8169:0 not found
atemsys: pci_find: ven 0x10ec dev 0x8168 nInstance 0
atemsys: pci_find: found 0x10ec:0x8168:0 -> 0000:02:00.0
atemsys: pci_select: 0000:02:00.0
pci 0000:00:1c.1: Error enabling bridge (-19), continuing
PCI device used by VMF 0000:02:00.0
PCI device 0000:02:00.0 has VMF device ID 0 and uses interrupt ID 16 vector 240
atemsys: pci_conf: legacy INT configured for device 0000:02:00.0
atemsys: mmap: Doing PCI device sanity check
atemsys: mmap: mapped IO memory, Phys:0xd0604000 UVirt:0xb7764000 Size:4096
atemsys: mmap: mapped DMA memory, Phys:0x28e00000 KVirt:0xe8e00000 UVirt:0xb727f000 Size:528384
0000000063: EtherCAT network adapter MAC: B0-25-AA-08-65-E3
0000001082: Bus scan successful - 2 slaves found
0000001089: Master state changed from <UNKNOWN> to <INIT>
0000002010: Master state changed from <INIT> to <PREOP>
0000005007: DCM in sync Cur=" 1155", Avg=" 0", Max=" -29071"
0000005023: Cyclic command WKC error on LRD - Address: 0x10000000 - WKC act/set=0/1
0000005023: Master state changed from <PREOP> to <SAFEOP>
0000005033: Master state changed from <SAFEOP> to <OP>
```

- Master demo application parameters:
 - -f /mnt/rfiles/eni.xml → ENI file exported before
 - Master sets network into OPERATIONAL

Step 5: EC-Engineer remote diagnosis

EC-Engineer [--]

File View Network Settings Help

Configuration Mode Export ENI Export EXI **Diagnosis Mode** Take Snapshot

Project Explorer

- Class-A Master <connected>
 - Slave_1001 [EK1100] (1001)
 - Slave_1002 [EL3702] (1002)**

Device Editor

General **Variables** ESC Register EEPROM Extended Diagnosis DC Diagnosis

Variables

Name	Datatype	Master Sync Unit	Offset	Size	Value	Forced
Slave_1002 [EL3702].Ch1 CycleCount.Ch1 CycleCount	UINT	Id 0: Default 0	IN : 0.0	2.0	23050	<input type="checkbox"/>
Slave_1002 [EL3702].Ch1 Sample 0.Ch1 Value	INT	Id 0: Default 0	IN : 2.0	2.0	24	<input type="checkbox"/>
Slave_1002 [EL3702].Ch2 CycleCount.Ch2 CycleCount	UINT	Id 0: Default 0	IN : 4.0	2.0	23050	<input type="checkbox"/>
Slave_1002 [EL3702].Ch2 Sample 0.Ch2 Value	INT	Id 0: Default 0	IN : 6.0	2.0	17	<input type="checkbox"/>

Chart

Edit Variable

Value: 23050 Dec Hex Force Release Add to watch list

Short Info

Information

Name	Slave_1002 [EL3702]
Description	EL3702 2Ch. Ana. Inp.
Vendor	

Networks: 1 Slaves: 2

Messages

Severity	Time	Message
INF	17:43:50	ENI file saved to C:\LxWinWorkspaces\RtFiles\eni.xml
INF	17:39:42	Master state change from 'Unknown' to 'Init'

State: ● Mode: DIAGNOSIS | EXPERT

- Fully integrated EtherCAT real-time solution
 - one vendor, one support contact
 - Acontis has expertise for Windows real-time extensions back to 1994 and is leading provider for EtherCAT software since 2005
- Key Features
 - Win32 real-time platform base on Real-time Linux
 - Most popular and de-fact standard RTOS
 - Deterministic and hard real-time
 - Microsoft® Visual Studio® support for the non-real-time and real-time part of the software
 - Class A EtherCAT Master Stack
 - High Performance real-time Ethernet Drivers
- All runtime components included: No additional license required
 - License for EtherCAT Class A Master Stack
 - License for RT-Linux based Windows Real-time Platform